

Policies and Protocols to Prevent the Spread and Costs of Clostridium Difficile Infection

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### **Abstract**

**Background:** Clostridium Difficile Infection (CDI) is a highly contagious, potentially lethal, and often preventable hospital acquired infection that costs the U.S. healthcare system billions of dollars annually. Because of the serious consequences and expensive nature of CDI, it is predicted the Centers for Medicare and Medicaid Services will begin following CDI trends and basing reimbursement on how well a facility can protect against this infection.

**Objectives:** The overall purpose of this quality improvement project was to develop, implement, and evaluate an evidenced-based protocol to guide the staff of the University of Cincinnati Medical Center (UCMC) to recognize and prevent the spread of CDI to all hospitalized patients.

**Methods:** A multidisciplinary committee was formed to evaluate UCMC's current CDI practices and determine which evidence-based interventions should be included in any policy changes. After a comprehensive review of the literature and staff interviews were performed, the CDI prevention interventions selected for this project included: standardized room cleaning, use of ultraviolet lighting, updated antimicrobial stewardship practices, disposable gown use, and staff education.

**Results:** After a review of the isolation protocol there were practices found that were not conducive to preventing the spread of CDI, and the committee focused on three aims: instituting reusable gowns while changing the process for ordering isolation supplies, education through online PowerPoint instruction, and implementing changes on a pilot unit. These changes resulted in 19 fewer cases of CDI at UCMC in the first six months of the current fiscal year.

**Conclusions:** A multicomponent, interprofessional, evidence-based, CDI prevention protocol may decrease the risk of hospital-acquired infections.

*Keywords:* cdiff, infection, prevention, diarrhea, hospital acquired infections, cdi, multidisciplinary, screening tool, bundle interventions

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### **Dedication**

I dedicate this manuscript to my daughter, Lauren, and my stepdaughters, Emma, Erika and Elissa. Let this journey show you to follow your dreams. Never let anyone or anything stop you, for anything is possible.

## Development and Evaluation of Evidence-Based Protocol to Prevent the Spread and Costs of Clostridium Difficile Infection in Hospitalized Adults

### **Chapter One: Nature of the Problem**

Hospital acquired infections are an important public health problem that can no longer be ignored (Jayaraman, Askari, Bascom, Liu, Rogers & Klompas, 2014). Hospital acquired infections (HAI) are so prevalent and dangerous that the Center for Medicaid and Medicare Services (CMS) is now following trends of certain infections. (e.g., Foley catheter and central line related) and basing reimbursement on how well a facility can protect against them (Lipp, Nero & Callahan, 2012). Falling closely behind Foley catheter and central line infections is an even more important HAI, that being, community and hospital acquired organism Clostridium Difficile Infection.

Clostridium Difficile Infection (CDI) is the main cause of diarrhea in hospitalized patients (Lipp, Nero, & Callahan, 2012). CDI is caused by spores that are easily spread and difficult to kill (Whitaker, Brown, Vidal, & Calcaterra, 2007; [www.ahrq.gov](http://www.ahrq.gov)). Commonly used hand sanitizers do not adequately the CDI spore. Proper hand washing techniques must be followed in order to kill the spore, thus preventing the infection. Spores can also survive on inanimate objects. Spores can live on bedrails, counter surfaces and floors, allowing for transference to other people or places (Whitaker, Brown, Vidal, & Calcaterra, 2007; [www.ahrq.gov](http://www.ahrq.gov)). Transference of the spore due to improper cleansing contributes to the spread of CDI in the community and other hospital rooms or patients. Given this transmission pattern, it is critical healthcare workers understand the cause of CDI in order to prevent its transmission (Lipp, Nero, & Callahan, 2012).

CDI is a significant cause of morbidity and mortality for hospitalized patients (Lipp, Nero, & Callahan, 2012). A patient who develops hospital acquired CDI (HACDI) has an associated increased length of stay and a significant increase in their hospital cost (Lipp, Nero, & Callahan, 2012). In 2011, CDI alone was responsible for 500,000 infections and contributed to 29,000 deaths (Lessa, Mu, Bamberg, Beldavs, Dumyati, Dunn, Faley, Holzbauer, Meek, Phipps, Wilson, Winsont, Cohen, Limbago, Fridkin, Gerding, & McDonald, 2015; [www.cdc.gov](http://www.cdc.gov)).

Financial impacts of this disease can not be denied. With an estimated 250,000 hospitalizations and 14,000 deaths per year, CDI has become a public health epidemic (Karanika, Paudel, Zeroub, Grigoras, Zacharioudakis, & Mylonakis, 2015). It is estimated CDI costs the United States healthcare system an extra one billion dollars in excess expenditures (Karanika, et. al., 2015; Waqar, Nigh, Sisler, Fanning, Tancin, Brozik, Jones, Briggs, Keller, LaSala, Krautz, & Khakoo, 2016). With figures like these, the concern for CMS to deem CDI as a preventable hospital acquired illness, thus basing reimbursement upon how well a facility prevents this infection, is increasing (Lipp, Nero, & Callahan, 2012). As CMS and private pay insurers begin to transition to alternative payment methods, healthcare systems must start to question prevention and education strategies (Lipp, Nero, & Callahan, 2012). Given these statistics, many healthcare systems are now beginning to ask critical questions such as “how can we best prevent the spread of CDI infections?” and “how do we ensure that all clinical staff adhere to evidence-based CDI prevention practices?”

The Chief Nursing Officer at the University of Cincinnati Medical Center (UCMC) recently became concerned about the annual number of CDIs. In fiscal year 2016, UCMC was in the top 25% of academic hospitals within the Vizient system (i.e., an organization that connects members with the knowledge, solutions, and expertise to accelerate hospital performance)

(www.vizientinc.com). UCMC's administration felt that this number was unacceptably high and decided to support the development of a quality improvement (QI) project aimed at lowering CDI rates.

The overall purpose of this QI project was to develop, implement, and evaluate an evidenced-based protocol to guide the staff of UCMC to recognize and prevent the spread of CDI to all patients ages 18 and older in all medical/surgical and intensive care units (ICUs) of the hospital. Standardized room cleaning, use of ultraviolet (UV) lighting, updated antimicrobial stewardship practices, disposable gowns, and staff education (where to wash hands, changes to the CDI policy, how to use the CDI screening assessments, and when to test for infection) were the interventions that were selected to help reduce the risk of CDI. We believed that the reliable use of these interventions would substantially decrease the number of hospital-acquired cases of CDI at UCMC. The specific aims of this QI were to:

**Aim #1:** revise UCMC's CDI policy to reflect the most current, evidenced-based CDI reduction strategies. These strategies included standardized room cleaning, the use of UV lighting, updated antimicrobial stewardship practices, and use of disposable gowns.

**Aim #2:** Educate nursing, medical and environmental services (EVS) staff about CDI and the best practices included in Aim 1 to prevent the spread of infection.

**Aim #3:** Evaluate the effect the revised UCMC CDI policy change and staff education had on CDI rates.

Hospital administrators believed that implementing such change would help UCMC reach its self-imposed goal of being in the top 10% of Vizient participants for CDI by the end of fiscal year 2017 (i.e. an overall reduction of 32 CDI cases in this time period). This QI project



was also consistent with UCMC's ultimate goal of providing excellent, academic healthcare to the people of Cincinnati ([www.uchealth.com](http://www.uchealth.com)).

## Chapter Two: Review of the Literature

### Clinical Practice Problem Statement

The PICOT question used to guide this QI project was: in hospitalized patients at the UCMC (**population**), does the use of an evidence-based CDI prevention bundle containing a standardized room cleaning protocol, use of UV lighting, updated antimicrobial stewardship practices, disposable gowns, and staff education (where to wash hands, changes to the CDI policy, how to use the CDI screening assessments, and when to test for infection) (**intervention**) compared to the current practice of non-standardized cleaning, no UV light usage, outdated antimicrobial stewardship practices, reusable gowns, and little staff education (**comparator**) reduce the number of CDIs within UCMC (**outcome**) over the course of a six month time period (**time**)?

### Evaluation/Summary of the Evidence

An extensive literature search of PubMed, CINNAHL, and a review of the National Guidelines Clearinghouse was completed to evaluate best CDI practices. A mixture of systematic reviews, retrospective cohort studies, quasi-experimental studies, qualitative case studies, tool kits, and clinical guidelines were evaluated. Key search words included: cdiff, infection, prevention, diarrhea, hospital acquired infections, cdi, multidisciplinary, screening tool, bundle interventions.

Criteria for choosing articles to review involved multiple factors. We chose a study for review if the included patient population matched the characteristics of patients served at UCMC. The patient population at UCMC includes hospitalized patients 18 years of age and older who are cared for in either an ICU or medical/surgical unit. It is important to note, however, that UCMC is a part of the broader UC Health system. This system includes both the

University of Cincinnati West Chester Hospital (UCWCH) and Drake Rehabilitation Center. This meant that any developed CDI policy would need to be relevant to the populations these other two facilities serve. We thus decided to retain articles relevant to the rehabilitation population.

Studies that included hospitalized patients from the ICU, Transitional Care Unit or Acute Care floor were included in the article reviews. There were other articles that were evaluated which did not meet criteria for intervention implementation, but gave some insight into methods that could be used at UCMC. Evidenced Based Practice (EBP) toolkits and clinical guidelines from the Society of Healthcare Epidemiology of America (SHEA) were also reviewed. Literature reports from the years 2007 to 2015 were included. The following is what the literature search revealed to be the best practice for the prevention of CDI in hospital systems similar to UCMC.

**Studies that utilized bundles to prevent HACDI.** In the effort to combat CDI, two major articles were published in 2015. The first was by Karanika, Paudel, Zervou, Grigoras, Zacharioudakis and Mylonakis. In this systematic review 9,146 articles were retrieved. Of those 9,146 articles, 22 articles were reviewed with a total of 80, 835 patients. They found that ICU patients have a higher prevalence of CDI than other hospitalized patients. They also found that these patients had a higher incidence of morbidity and mortality. Increased hospitalizations, with increased financial burdens to the patient and institution were also found. All explored outcomes were statistically significant p values. This study not only highlighted the need for more preventative and treatment studies to be conducted in this area, but also showed the importance of the PICOT question being asked.

Cruz-Betancourt et. al. (2015), performed a study that consisted of Advanced Practice Nurses, Physicians and Pharmacists who were dedicated to finding a strategy to identify those at

risk for CDI and implement multidisciplinary interventions to negate that risk. Their retrospective analysis study screened 1066 patients over a 12-month period and developed a predictive screening tool which highlighted risk factors for HACDI. Using this predictive tool, 217 high risk patients in the 20 bed, Vascular-Thoracic Intensive Care Unit (VTICU) were identified as HACDI positive. The risk factors associated with being high risk were: history of immunosuppression, history of CDI within 60 days prior to admission or those receiving three or more antibiotics at a time. These patients received a preventative measure bundle.

The CDI preventative bundle that was used in this study included using a screening tool for risk, probiotic use for high risk patients and stopping acid suppressive therapies for those at risk patients. In addition to these preventative measures, strict daily cleaning of high touch areas using a 10% sodium hypochlorite solution and improved hand hygiene were also added. The results showed a dramatic decline in CDI infections for the 12 months the study was conducted when all portions of the bundle were followed. Prior to bundle implementation, CDI rates were 14.7/10,000 patient care days. Post bundle implementation, statistics showed 3.12/10,000 ( $P=0.025$ ) patients being infected. The difference with these results, compared to other studies, was that it showed how not only pharmaceutical management mattered in the reduction of CDI, but how controlling environmental factors also helped. A large sample size was used in the development of their predictive tool. While the sample size was small to evaluate the effectiveness of the interventional bundle, the significance of the findings could not be ignored.

Brumely, et. al. (2015), designed a quasi-experimental study involving 169 patients throughout their entire hospital. Patients age 18 or older who tested positive for CDI from January 1, 2013 to March 31, 2013 were included for historical group data. Those who were 18 or older with a positive CDI from January 1, 2014 to March 31, 2014 were included in the

interventional bundle group. The CDI bundle that was created two years prior to the start of the study consisted of a surveillance system which reviewed each patient who tested positive for CDI. Each patient receiving Vancomycin was also screened to ensure that Vancomycin was being prescribed appropriately. Appropriate CDI antimicrobial therapy per the institution's standards, discontinuing acid suppression therapy and discontinuing unnecessary antibiotics were the other parts of the CDI bundle. Further portions of this bundle included a series of questions to be answered by the provider daily for each of these patients regarding discontinuation of unnecessary antimicrobials and acid suppression medications and whether Infectious Disease physicians were consulted.

The 169 patients were split into pre bundle implementation (89) and post bundle implementation groups (83). Their findings were significant for a decreased CDI rate. Post bundle implementation ( $P < 0.001$ ). This is instrumental in refining the PICOT question, it did illustrate that bundles and interprofessional collaboration were paramount in managing CDI patients.

Furthering this thought was the study completed in Morgantown, West Virginia at their 531 bed tertiary care center. Waqar, et. al., 2016 published their multidisciplinary study. This multidisciplinary task force incorporated educational posters, increased signage on each door to signify hand washing with soap and water, bleach at 1:10 for terminal cleaning, computer based CDI learning, an antimicrobial stewardship committee, auditing of high touch surfaces after terminal cleaning, and hydrogen peroxide vapor for decontamination from January-December 2013. The monthly rate of 12.5 per 10,000 patients decreased to 7.8 in 2014 with a  $P = .001$ . While the use of hydrogen peroxide vapor was different from UV light used in other studies, the multidisciplinary task force was the main factor in achieving the reduction in CDI.

All of the aforementioned studies help to corroborate findings from Whitaker, Brown, Vidal, and Calcaterra (2007). In this case study involving a 46-bed tertiary care hospital, all ICU patients with a positive HACDI culture were reviewed over a 24-month period. Originally, CDI patients were not going to be part of this study. However, there had been a dramatic increase in the number of CDI patients so it was added. What they found was that cleaning with a 10% hypochlorite solution, improving soap and water hand hygiene among staff, educating patients and visitors, having daily isolation rounds, standardizing nursing unit processes, and having automated report functions decreased the incidence of HACDI by 66%. While data from this study is nearly a decade old fact that there was a significant decrease in the incidence of HACDI in this facility, which is similar to UCMC, and used a multidisciplinary approach to the problem similar to what UCMC is proposing to use makes the study an important one for this QI project. The interventions and cleaning solutions used were the same as those mentioned in other studies which also supports the findings in the study.

**Clinical practice guidelines for HACDI prevention.** Cohen, et al., (2010) had the most re-cited work associated with this literature search. Their Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases of Society of America (IDSA) Clinical Practice Guidelines for CDIs in Adults developed an outline to aid physicians in the diagnosis and management of CDI. For this update, they reviewed data from 1994 to 2010. The group used an evaluation tool to weigh the evidence related to each intervention. The group was unbiased and had outside reviewers evaluate their work prior to publication. They also noted gaps in the research for future work. The interventions and recommendations are echoed within each study released after its publication. The Guideline also scored 152 points out of a possible 158 using the AGREE II tool.

The recommendations from this tool included an antimicrobial stewardship protocol to evaluate antibiotic use in the hospital. They also recommended identifying those patients most at risk for CDI to ensure that all medications are appropriate for them especially if they are on antibiotics. All patients should be monitored for signs and symptoms of CDI. Education of visitors and staff and following appropriate isolation of CDI patients (proper gowns and gloves and washing hands with soap and water) were the other major recommendations by the committee.

While not as widely cited as Cohen, et. al., work, Lessa, et al., (2015), denoted the extreme threat that CDI exhibits to the healthcare system as well as the regular population. They found that CDI was responsible for half a million infections and attributed to approximately 29,000 deaths in the year 2011. Populations noted to be most at risk were females, Caucasians, and those 65 years of age or older. This work sounded the alarm on future monitoring for progression and treatment of the disease and provided background for why this project is so important to UCMC.

**Studies that evaluated PPI use and HACDI.** Stopping the progression of the disease was evaluated by McDonald, Milligan, Frenette & Lee in 2015. This group of physicians and public health administrators evaluated whether the use of proton pump inhibitors (PPI) was associated with a higher incidence of recurrent CDI. The thought was that PPIs are overprescribed and could lead to a higher incidence of CDI. Because PPI cessation had been discussed in some studies, but not others, it was important to evaluate the effectiveness in fighting CDI. The retrospective cohort study evaluated a total of 754 patients at two different Canadian hospitals. The first hospital was 417 beds while the second was 517. Both were university hospitals. A multivariate Cox proportional hazards model was used to evaluate the cause-specific hazard

ratios for recurrent CDI. It found that there was a recurrence rate of 1.5 (95% confidence interval, 1.1-2.0) for those older than 75 years of age. For continuous PPI use, 1.5 (95% confidence interval, 1.1-2.0) was found. The use of PPI was common at 60.7% and only 47.1% had a clinical indication for continuous PPI use. Only 3 patients had their PPI discontinued. UCMC ASP committee reviewed this research and felt that discontinuing PPI was not a significant factor in preventing CDI so it was not made a part of UCMC's bundle. The results of this study have not been validated with other research, therefore, UCMC ASP committee did not feel it warranted a change in practice.

**Studies that evaluated UV lighting and HACDI prevention.** Liscynesky, Hines, Smyer and Hanrahan (2017) evaluated whether or not the use of Ultraviolet light via towers placed in a triangle shape around the room was more effective at disinfecting the patient's room than bleach cleaning alone. Since CDI spores can live on surfaces for up to 5 months, it is imperative that cleaning solutions are adequate at eradicating them. Use of UV lighting had been important in some CDI bundles, so individual evaluation of the use was also important. They cultured 476 sites over 4 months with 186 cultures originating from the bathroom and 290 from the patient room. Prior to the Ultraviolet (UV) light treatment 32 of 238 (13%) were positive after bleach cleaning in the patient room while 5 of 88 (6%) were positive in the bathroom. The two most common sites were the toilet seat and over-bed table. As for UV treatment, only 1 of 238 high touch surfaces was positive after treatment. Therefore, they observed a statistically significant decrease in positive cultures in UV light rooms for sporicidal cleaning when used with bleach cleaning.

**Studies that evaluated the financial impact of HACDI.** Lipp, Nero and Callahan (2012) reviewed 4,853,800 patient discharges from 2007-2008 in the state of New York. It revealed that



HACDI presented a major burden to the fiscal welfare of the United States' healthcare system increasing the length of stay and cost of hospital care for each CDI patient. Because of the enormous financial impact highlighted by this study, healthcare institutions would benefit from better understanding the prevention and treatment of this disease. Part of that understanding centers around transmission of the spore.

### **Critical Appraisal of the Evidence**

The evidence presented in each article reviewed was summarized and rigorously analyzed using Tables and a formal Evaluation Summary (**See Supplement**). Only articles with the strongest evidence were used for implementation interventions. The SHEA and EBP toolkits were reviewed using the AGREE II instrument. The AGREE II instrument is a tool utilized for evaluating the strength of clinical practice guidelines. In this case, the SHEA guideline received an almost perfect score for its development. Future changes to the document and areas to implement were the only portions of the guideline which did not receive full marks. It received a score of 152 out of a possible 158. As for the EBP toolkit designed by the AHRQ, it received the full 158 possible points because it was easily applicable and was founded in research based evidence.

### **Gaps in the CDI Literature**

Gaps in the literature are common in any research area and CDI is no different. Some of the major gaps in the literature as identified by SHEA are the need to: develop an adequate severity diagnostic tool, more effective preventive techniques, and increase understanding of the basic biology of CDI (Cohen, et al., 2010). Development of an adequate severity diagnostic tool would allow for better treatment options particularly regarding defining the role of fecal transplant in treating CDI patients (Cohen, et al., 2010). Probiotic or bio-therapeutic agents, an

understudied area of CDI treatment, would also have a better place in the CDI toolkit if more research were conducted in this important area (Cohen, et al., 2010). Investigation of what causes the germination of the CDI spore in the gastrointestinal track would allow for better prevention of CDI (Cohen, et. al., 2010). Finally, the most interesting gap in the literature was brought out by a researcher who noted that while there are numerous articles about bundle approaches to effectively combat CDI, there is a lack of randomized trials that assess the causal relationship between the interventions themselves and CDI rates (Barker, Ngam, Musuuza, Vaughn, & Safdar, 2017). More well-designed interventional research into this relationship is needed to better evaluate how to protect patients against CDI.

### **Presentation of Theoretical Basis**

Theories, models, and frameworks provide a foundation for institutions to implement change or conduct business on a daily basis. To invoke any needed changes in clinical practice and motivate staff to reach organizational goals, UCMC uses *Kanter's Theory of Structural Framework with Servant Leadership*. Administrators have found that this theoretical model inherently provides a network that allows UCMC employees to be involved in process improvement, have their opinions heard, and provides them the tools necessary to complete their jobs (Northouse, 2015). Kanter's theory is grounded in the thought that staff perform better when leaders value their opinion (Laschinger, Purdy, & Almost, 2007). These leaders provide their staff with the necessary tools to complete tasks with precision (Laschinger, Purdy, & Almost, 2007). Servant Leadership, a type of leadership that emphasizes that the needs of the employee come first, builds strong relationships (Northouse, 2015). This creates a bond between staff members and leaders that decreases the anxiety related to making major practice changes and leaves employees feeling empowered to accomplish organizational goals. (Northouse, 2015).

The *Eight Step Problem Solving Model* was another tool used by UCMC to help with the development of the CDI policy ([www.wvde.state.wv.us/insite/files](http://www.wvde.state.wv.us/insite/files)). By using this model system wide, each UCMC department follows the same protocol for QI projects. The eight steps of this model include: 1) clarifying a problem, 2) breaking down a problem into smaller pieces, 3) setting a target, 4) identifying the root cause of the problem, 5) developing interventions, 6) making an implementation plan, 7) tracking progress, and 8) spreading the interventions. ([www.wvde.state.wv.us/insite/files](http://www.wvde.state.wv.us/insite/files)). Each of these steps were used in the current QI project (described in Methods section) and completed with a multidisciplinary committee consisting of nurses, administrators, environments services (EVS), Infection Control, and physicians. The CDI committee met on a weekly basis to complete the steps.

Even though an EBP model was used to guide the committee on how to break down the analysis portion of the problem, a theory to evaluate the effectiveness of the interventions was also needed. For this particular change project, a single system design theory was chosen. A single system design was chosen because it will accurately evaluate how successful each intervention was to meeting the goal (Thyor, Artett, & Shek, 2003). An A-B design choice allowed for the comparison of the intervention against the baseline data (Thyor, Artett & Shek, 2003). UCMC integrated each of these theories, frameworks and models to assess, plan, implement and evaluate the CDI QI project.

### **Risks and Benefits of CDI interventions**

The risk of not implementing CDI interventions is high. Patients will suffer increased morbidity and mortality and great financial harm (in the form of increased hospitalization bills from increased length of stay) from CDI while at UCMC if these interventions are not implemented (Lipp, Nero & Callahan, 2012). While there is small risk of patient harm with UV

lighting, those risks are almost non-existent if appropriate safety precautions are followed (Liscynsky, et. al., 2017).

The benefits of these CDI interventions will be seen in fewer CDI cases and less financial burden to the patient and hospital (Cruz-Betancourt et. al., 2015; Brumley, et. al., 2015). Staff will give advanced medical care which will be a benefit of the education received from the intervention. Patients are also a recipient of that benefit, but the pride and sense of accomplishment that the staff receives is immeasurable. Overall, the risks of implementing CDI interventions are low while the benefits are high.

### **Identification of Key Stakeholders**

The businessdictionary.com defines a stakeholder as a person, group, or organization that has interest in the organization's wellbeing (2017). Stakeholders can be directors, employees, administrators, governmental agencies or creditors ([www.businessdictionary.com](http://www.businessdictionary.com)). For UCMC, the stakeholders are a mixture of staff, directors, administrators, employees, Board members, accountants, and patients and their family members and the community. The staff/employees have a stake in providing extraordinary care. Without the proper guidelines/policies in place to accomplish this, their job cannot be completed. If patients perceive the care they receive from UCMC to be sub-par, then the hospital will have a drop in revenue related to decreased admissions. This will negatively affect the staff's pay and, eventually, their job.

As for the administrators, directors, or managers their stake is similar to that of the employees. However, it goes beyond job security. Their stake is to ensure that they have given the employees the necessary tools, guidelines, policies, and processes to make the staff efficient and productive. If the policies and processes are not up-to-date and efficient then the employees cannot carry out their task. If the employees' tasks go unfulfilled then the care delivered by

UCMC is below their goal. Not meeting the UCMC mission will doom the hospital to failure. If the hospital is failing due to poor administrative choices, then the Board of Trustees will make changes within the administrative line.

Creditors for UCMC come in the form of trustees and the accounting department as UCMC is a nonprofit hospital. The hospital is run by a Board of Trustees. The Board is group of businessmen/women who make decisions regarding finances of the hospital. If the hospital is not performing to the standards that they have set, then the Board will step in and make administrative changes. The Board wants the hospital to be profitable. As part of that endeavor, they make financial decisions to move the hospital in that direction. The Board of Trustees needs the hospital to provide excellent care to patients and to have a reputation of providing excellent care to patients, in order for the hospital to meet its' financial goals. The accounting department assists the Board in this endeavor.

The accounting department reviews each purchase, staff request, and supply use in order to maintain a balanced budget. Their responsibility is to ensure that each department follows a budgetary path that will lead the hospital to profitability. By closely monitoring supply use and staffing, the accounting department makes sure that the hospital stays on target. They are also responsible for evaluating new purchases and assessing quality changes. Their input into how changes in supplies (i.e. disposable gowns) is invaluable. They are yet another stakeholder in ensuring that the CDI policy change is effective.

Lastly, the people of Cincinnati and the patients at UCMC are stakeholders and they happen to be the most important. Hospitals open their doors and conduct business to improve and sustain life. Part of that endeavor is to stop the spread of disease. CDI is a potentially life threatening disease that can be prevented with proper policies and techniques. In order for

UCMC to meet its' goal of delivering excellent, academic medicine they must have policies and procedures in place to prevent CDI within, and outside, the hospital walls. For only then will UCMC provide the care they seek to achieve. Now that the issues have been brought to the forefront, and those most likely to benefit from the change have been identified, engaging these individuals to the cause will be discussed.

### **Strategies to Engage**

Engaging people to make changes is difficult. The task usually falls to the leadership of the company to make change happen. However, it is not only the top administrators that must be behind the change process. Middle managers must support the change process in order for (Aarons, et al., 2016). After all, middle managers have direct access to the staff. If middle management is not behind the change, then success of the project can be thwarted before it is begun (Aarons, et. al., 2016). Therefore, the first step is to engage leadership in the change process.

Leadership encompasses the persons and theories utilized by the organization to further their own goals and initiatives (Northouse, 2015). As stated, UCMC uses Kanter's Theory and Servant Leadership to develop and implement the CDI isolation protocol. Doing so will increase the acceptance of the policy with less anxiety and stress (Northouse, 2015). Middle managers will be more likely to support this change since they have had input along the developmental pathway as well (Aarons, et. al., 2016).

Provision of compassionate, thoughtful leaders who value the insight of the employees was evidenced by the creation of the Link nurse committee. These nurses are specially trained to evaluate the infection control policy on their unit. Because of this training and the individual's acknowledgement of their passion in that area, they formed a committee to bring to light the

impedences with the current infection control practices at UCMC. Allowing the nurses to speak about the problems and offer solutions to the problems was the first step in engaging the staff. It also showed the staff that their opinions were valued. Valuing the nurses' opinions was the first step in creating a partnership for change. It also helped to create a bond between the staff and the administration. The bond, and valuation of the nurses, will help to ensure that the change will be implemented successfully.

Acceptance of the new policy by the Link nurses is also invaluable. The Link nurses will be the champion for the change on their unit. They will also be responsible for most of the education. Providing adequate education to the staff will lessen the anxiety and increase the acceptance of the new policy. While not yet implemented, a friendly competition between units of the hospital would also help with adherence to the change. The unit which shows the most improvement and least CDI cases for the month receives a prize. Finding small ways to decrease anxiety and foster adherence to the protocol is essential in ensuring that the policy will be successful.

### **Identification of Potential Implementation Barriers**

Anytime that change processes are initiated there will be barriers. We anticipated some of the potential barriers with this QI project would include: staff resisting the change, managers resisting the policy change, supply shortages, and time. Staff will always be resistant to change. However, the staff had significant input into identification of the problems and solutions of this process change. The changes made will, hopefully, lessen their responsibilities and burdens when caring for isolated patients. Discussing those points will lessen their resistance to the change.

Different managers were a part of the QI project since its beginning. Each manger was brought into a CDI committee meeting to discuss their unit's specific needs prior to implementation of the change. It was believed that allowing the manager to discuss their specific needs, barriers and challenges of their unit prior to implementation would help them feel part of the process and increase their support of their project. Completing the project this way helps to fulfill parts of the Servant Leadership theory that UCMC has adopted and will help to successfully accomplish this change process.

Supply shortages when the policy changes first start may dampen the effectiveness and acceptance of the new policy. One of the staff's first complaints about the breakdown in the current CDI policy was the promptness with which the isolation cart was supplied. After hearing this compliant, the CDI infection control committee took suggestions from the literature and other hospitals' practice to change the supply chain. With the implementation of the new policy, an isolation cart will be supplied on each floor. Therefore, immediate isolation of the CDI patient can be accomplished. This will lessen the burden on the bedside staff to locate the cart and initiate isolation. Overall, the staff's concerns with supplies has been addressed and will increase their acceptance of this EBP project.

Time is a limiting factor in so many aspects of life. Not having supplies ready when needed will delay the patient in being placed in isolation. Not having enough staff capable of operating the UV light will delay cleaning the CDI room. Not implementing the change on the unit when the policy is first enacted will delay the data from being collected. Time is a factor that will be difficult to control, but with the right planning should not be an issue. Education of the staff will take place in time for them to be familiar with the policy change and ask questions. Ancillary staff has been hired and their completion of the new policy requirements will take



place in orientation. Supplies have been ordered and will be ready for initiation of the policy. As hard as time is to control, the planning process is such that time will not be a problem.

### **Conclusion**

Through the use of systematic reviews with meta analysis, retrospective analysis studies, quasi-experimental studies, qualitative case studies, retrospective cohort study, tool kits, and clinical guidelines the best approach to addressing CDI is through a bundled approach. The bundle should include an antibiotic stewardship practice committee that evaluates antibiotic use appropriateness, staff education that includes hand washing technique, isolation protocol, UV lighting to clean rooms, standardized room cleaning, and changing to disposable gowns. For UCMC, it also means updating an outdated CDI policy. Education for the entire staff in the hospital must also occur.

The potential rewards for successful completion of this quality QI project are immense. The hospital may not only save lives, it will possibly reduce costs and increase the quality of care given to patients. The barriers for successful completion are few. With good planning, which is in place, the acceptance of this new initiative will likely be high. There are few risks to implementing these interventions, but huge rewards for the patients, staff and administrators at UCMC.

### **Chapter Three: Methods**

#### **Recommendations for Implementation of Practice Change for CDI Policy**

Researchers have discovered that a multidisciplinary, team-based approach is the most effective means of prevention of CDI (Cruz-Betancourt, et. al., 2015; Koll, et. al., 2013) in hospitalized patients. The multidisciplinary team should consist of a Pharmacist heading an antibiotic stewardship program and Registered Nurses (RNs), Physicians, and Environmental Service personnel (EVS) actively and effectively collaborating to prevent the spread of CDI (Cohen, et al., 2010; Whitaker, Brown, Vidal, & Calcaterra, 2007). All RNs, hospital staff, visitors, and physicians need to follow correct CDI isolation techniques and EVSs should use a 10% hypochlorite solution and UV lighting when cleaning each room.

Importantly, all hospital staff must also be able to understand and follow the CDI policy and consistently use proper hand washing techniques in order to stop the spread of CDI. Both RNs and physicians must be able to accurately identify patients with CDI symptoms. Research has shown this identification is made easier through the use of an official CDI assessment tool embedded in the patients' electronic medical record and by using a multidisciplinary rounding team on each unit to review all actual and potential CDI cases. (Cohen et al., 2010; [www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/cdifftoolkit/index.html](http://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/cdifftoolkit/index.html); Whitaker, Brown, Vidal, & Calcaterra, 2007)

Finally, periodic audits of CDI-related policies and antibiotic stewardship program compliance are essential ([www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/cdifftoolkit/index.html](http://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/cdifftoolkit/index.html)). Without continued surveillance, any QI program will not be able to continually measure its' effectiveness. Likewise, audits of staff adherence to the protocol is strongly encouraged (Whitaker, et.al., 2007). The epidemiological trends of

compliance and transmission should also be tracked in order to ensure that the current practice is effective (Whitaker, et.al., 2007). Lastly, audits for thorough cleaning of each CDI room should be completed to ensure that all high risk areas are being adequately cleaned 100% of the time (Waqar, et. al., 2016). Occasionally, areas will be missed and audits will help bring attention to the mistake before it can become widespread (Waqar, et. al., 2016).

### **Aims**

There were three discrete aims for UCMC's CDI QI project. The first aim was to revise UCMC's CDI policy to reflect the most current, evidenced-based CDI reduction strategies. The CDI reductions strategies selected for this work included standardized room cleaning, the use of UV lighting, updated antimicrobial stewardship practices, and use of disposable gowns. Next, we aimed to educate nursing, medical, and environmental service (EVS) staff about CDI and the best practices included in Aim 1 to prevent the spread of the infection. Finally, we sought to evaluate the effect the revised UCMC CDI policy change and staff education had on overall CDI rates.

### **Design**

A single system analysis of the bundle occurred by tracking the number of CDI cases that occurred throughout UCMC and WCH (Thyor, Artett, & Shek, 2003). Infectious Disease tracked CDI cases prior to implementation of the interventional bundle. A single system design was chosen because it will accurately evaluate how successful each intervention was to meeting the goal (Thyor, Artett, & Shek, 2003). An A-B design choice allows for the comparison of the intervention data against the baseline data (Thyor, Artett, & Shek, 2003). The data is evaluated prior to the implementation of an intervention (A portion) and the data is evaluated again after

then intervention is performed (B portion) which allows for direct comparison of the data pre and post intervention (Thyor, Artett, & Shek, 2003).

### **Sample/Practice setting**

UCMC is a 525 bed, tertiary care, Level I trauma center. This hospital admits approximately 19,000 patients per year with about 1500 births per year. Average length of stay for fiscal year 2016 was 5.75 days. We made the decision early on to initially pilot test the CDI QI project on a single medical/surgical unit at UCMC. Because it had the highest incidence of HACDI, we chose UCMC's 8CCP as the pilot unit. This unit contains 24 hospital beds that are normally occupied by transplant patients. Once 8CCP staff reported being comfortable with the policy change, and there was demonstrated reduction in the number of CDIs per month for two consecutive months, the plan was to implement the new CDI policy in an additional medical/surgical unit. The unit added would be one that has the next highest monthly average of CDIs. Next, we planned to add all of UCMC's ICUs by March 2018. After that, we would add all of the other hospital units with the goal of having the entire hospital using the new CDI policy by June 2018.

### **Assessment of Institutional Readiness for Change**

Having a high volume of CDI patients and realizing that there are problems with the current process has made UCMC's administration ready for a change. Because the staff of 8CCP have personally experienced problems with obtaining supplies and caring for CDI patients, they were completely engaged with creating a CDI policy change, willing to trial new protocols, and discuss what is and is not working with the new process. There was no formal evaluation of the readiness to change on the floor. However, success with pilot units trialing QI change was shown

with the nurse driven Foley catheter protocol was released the year before the CDI QI project began. Therefore, the pilot unit method was chosen with the CDI QI project.

### **Ethical Statement**

Approval for this quality improvement project was obtained through the Internal Review Board (IRB) at UCMC which deemed this project a quality improvement project that does not meet the requirements for IRB oversight.

### **Methods**

**Aim 1. Revise UCMC's CDI policy to reflect the most current, evidenced-based CDI reduction strategies.**

#### **Creation of the CDI committee.**

Multi disciplinary members of the CDI committee were chosen by the Director of Quality Improvement. Members consisted of the manger for 8CCP, the Director of Medical-Surgical Services, EVS Director, Director of Accounting, Infectious Diseases Director, Nutritional Services Director, Supply Management Director, and BSN and DNP students who were helping with the project. By choosing a multidisciplinary group, the Director of Quality Improvement ensured that all facets of patient care would be addressed.

**Link nurse interviews.** The next step in revising UCMC's CDI policy involved interviewing Link nurses from each unit regarding the current CDI processes. Link nurses are specially trained infection control nurses assigned to each hospital unit. Their job is to evaluate and educate healthcare providers about infection control policies/problems within their assigned unit. Link nurses at UCMC attend infection control classes each year to keep them up to date on current, best practices. In January 2016 we assembled all Link nurses into one room and the CDI isolation process from admission to discharge was explored using a process map method. Each

method of admission (whether from the emergency department, a transfer from another unit/hospital, or a direct admission) was reviewed. We wrote each step of the process onto a poster. We then placed post-it notes of actual and perceived problems under each step. After the in-person meetings, we summarized all steps and actual and perceived problems regarding UCMC's current CDI practices.

**Eight-step process.** To address the feasibility, usefulness, financial, and quality control aspects of implementing the evidence-based CDI interventions, the CDI committee developed a grading system for each proposed CDI prevention intervention. The committee decided which interventions to trial using the grading system depicted in **Table 1**. The committee chose interventions that they believed would have the largest impact on CDI rates with the smallest financial burden. The interventions included: standardizing room cleaning, using UV light in each CDI room, antimicrobial stewardship standards, disposable gowns, and staff education (where to wash hands, gowns to use, rewriting policy, screening assessments, when to test).

The 8 Step Process began in April 2016 or the first step (i.e., clarification of the problem), the CDI committee reviewed UCMC's current practices and what varied from the EBP guidelines. Next, the problem was broken down with a process map (described above) and a target CDI rate was set. We then further explored the root causes of the currently high CDI rates. There were several occasions where we had to use the process map procedure. An example of this involved the contents and delivery of isolation carts. When we identified variances/problems, the CDI committee immediately tried to identify a strategy to fix them. Lastly, we formulated an implementation and auditing plan.

Once we evaluated the current CDI isolation process, we explored more deeply EVS's current cleaning practices and found that UCMC was not currently using UV lighting for

terminal room cleaning. The CDI committee decided that this needed to be changed, and the use of UV lighting should become standard of care. Further, the committee decided that this practice should undergo periodic monitoring to ensure that all isolation rooms have UV lighting with the terminal clean. We planned for these audit to be conducted on all HACDI patients over the course of six months.

We then turned to examining current antimicrobial stewardship practices. The CDI committee decided pharmacists should take the lead with this part of the project. In May 2016, UCMC pharmacists began reviewing the current ASP policy that was already in place to make sure that it was consistent with the most recent guidelines. They specifically looked at whether or not they will be stopping acid suppression medications in CDI patients, as the evidence is weaker for that indication. While pharmacy already had hard stops for antibiotic ordering, the last piece the subgroup evaluated was the possibility of having a best practice advisory placed in the hospitals electronic medical record system (i.e., EPIC). They believed doing so would help identify those patients most at risk for developing CDI upon hospital admission. A new upgrade to EPIC took place in the fall of 2017, which made this possible.

**Budgetary assessment.** We anticipated budgetary concerns for this QI project would include the costs associated with changing isolation gown type, the time required for staff education, the need to purchase UV lighting equipment, and additional small supplies (e.g., disposable thermometer dots, masks, gloves, and bleach wipes). We anticipated no large, capital expenditures would be needed for this program to be successful.

The change in gown usage was addressed using a formal cost analysis performed by the accounting department who had a representative assigned to the CDI committee. This

representative evaluated the cost of cleaning and re-using reusable gowns compared to the cost of using disposable gowns.

**Methods Aim #2: Educate nursing, medical, and EVS staff about CDI and the best practices included in Aim 1 to prevent the spread of the infection.**

**Daily rounding.** To assist with educational efforts, the CDI committee decided that UCMC would begin instituting daily rounding with the physician groups. Each morning, when the physicians would make rounds on the patients, one designated nurse would round with them reminding them to don gown and gloves prior to entering the room. Likewise, on the way out of the room, the nurse would remind everyone to wash their hands with soap and water. This was instituted in an effort to increase compliance with contact plus isolation protocols among the physicians and decrease the likelihood that the spore would be spread to other patients as a result of noncompliance with the protocol.

Each unit would also have an infection control champion, which would be the LINK nurse for that unit. The LINK nurse would identify the number of patients on isolation on each floor each day and remind the staff to pay careful attention to isolation protocol. The staff nurse would take charge of reminding each team member and visitor to don correct isolation gear for when seeing patients and to wash their hands with soap and water before and after leaving the room.

**CDI handbook.** We also began the creation of CDI handbook with information about the isolation policy and proposed interventions. When Foley catheter and central line infection protocols were established, UCMC developed a similar handbook that staff could easily reference. CDI would have a similar handbook that will make following the policy much easier for all. The role of this book would be to increase knowledge of CDI prevention protocols and



practices so staff members can familiarize themselves. The goal was to have this handbook completed after the intervention was piloted tested on 8CCP (March 2018).

**Visual reminders.** We also planned to use visual reminders. These signs would be posted outside of the room on the patient's door. Their purpose was to draw attention to the need to wear gown and gloves prior to entering the room and to wash hands with soap and water as hand sanitizer is not effective against the CDI spore.

**Annual CDI training.** Finally, in terms of education, we planned to incorporate CDI training into yearly required competency training. A PowerPoint training tool was developed to educate staff. In this PowerPoint staff was educated about what CDI is, how it is spread and the potentially deadly consequences of the spore. An educational CDI PowerPoint will be added to the orientation material for every employee which must be completed before the end of their orientation period. It will be computer based learning with a small quiz that must be passed at the end. At this time, there are no other formal teaching strategies for hospital employees being developed. Continuing medical education seminar information are made available for staff to register and attend.

**Methods Aim 3: Evaluate the effect the revised UCMC CDI policy change and staff education had on CDI rates.**

The Infection Control Department recorded all UCMC CDI occurrences from Fiscal Year 2016 (July 2015 to June 2016) into an Excel spreadsheet. CDI occurrences were counted if the patient did not exhibit signs or symptoms of CDI at the time of admission or symptoms of CDI began more than 48 hours after admission. By definition, this is hospital acquired CDI (HACDI). This "baseline" data was then compared to data that was collected from Fiscal Year 2017 (July 2016 to 2017); the time when the CDI policies and educational efforts were being

developed and necessary supply changes were being ordered (“planning period”). Finally, we collected 6 months’ worth of data from Fiscal Year 2018. This “post-implementation” period represented the period in time when the pilot unit implemented several parts of the new CDI policy (see results). The original goal for UCMC was set at reducing CDI cases at UCMC by 32 for fiscal year 2018 (July 2017-June 2018) which would place UCMC in the 15<sup>th</sup> percentile for Vizient participating health centers.

## **Conclusion**

Using an 8 Step Problem Solving Model, the multidisciplinary CDI committee evaluated the CDI problem and developed solutions. The interventions were chosen from the research. A trial unit was chosen based on the readiness for change and number of CDI cases per year. Data was collected by the infection control department with the help of the electronic medical record. Progress was tracked by the committee on a weekly basis. Potential barriers and costs were evaluated and processes to help stop them prior to trial implementation were started. Facilitators for the project were recognized and engaged prior to trial implementation. See **Figure 2** for a timeline of the major events throughout this quality improvement project.

## **Chapter Four: Findings**

### **Results/Outcomes Aim 1.**

We made a number of important revisions to UCMC's CDI policy during Fiscal Year 17. We found the largest risk to patients involved the inadequate upkeep of the re-usable gowns UCMC used for isolation patients. Reusable isolation gowns have a shelf life of 76 uses. After 76 uses, the gowns no longer contain their protective, antimicrobial coating. There is a tag inside the gown which was supposed to be marked off each time the gown was laundered. We discovered that this marking was not happening and were unable to tell how long the existing gowns were actually in use. To address this problem, the committee decided to evaluate two different types of disposable gowns on the pilot unit. While use of disposal gowns was not an intervention found in the literature reviewed, the CDI committee felt that the risk of not removing out of date, reusable gowns was high enough to warrant a change to single use gowns. This is an oversight that would not have been caught had the committee never been established.

We also changed the process for ordering isolation supplies. Current practice had isolation carts being brought up from central supply when an isolation order was placed in the electronic medical record. We found this act could take over 45 minutes to complete. Therefore, instead of central supply bringing up an isolation cart, CDI isolation supplies are now placed directly in the unit. This alleviated the lag time from initiation of isolation to receipt of the supplies. Adequate restocking of the isolation supplies was also addressed through extra, pre-made isolation carts being placed in Central Supply. When a unit ran out of supplies in one cart, another was cart was brought up. Finally, extra isolation gowns are now kept in the supply room on each floor as well.

We then addressed equipment-cleaning problems. Staff consistently reported that equipment was not being properly cleaned after being used in an isolation room. Higher than normal patient volumes and a lack of needed equipment were cited as the root causes for this problem. Because of this concern, the CDI committee decided that ancillary staff (patient care associates) would now dedicate equipment to an isolation room to stop cross contamination. Central supply would also stock disposable thermometer dots in the isolation cart so that thermometers would not be taken from room to room. Finally, automatic blood pressure cuffs were longer used on isolated patients unless there were enough machines for the isolated patient(s) on the floor to have a dedicated machine.

When the CDI patient was discharged, each unit had different expectations as to who would be responsible for cleaning which equipment. In some units, the RN was supposed to clear the room of all IV poles and medicine related equipment. Part of that processes included cleaning each piece with the 10% hypochlorite solution wipes or bleach wipes. We found that the reasoning behind the RN cleaning the IV poles and medicine equipment was that patient care associates and ancillary staff are not licensed to handle medications. Since medications were sometimes still contained in the IV pump or on the pole, the RN was responsible for removal and cleaning. In other units, it was a mix of the RN removing the medicine and EVS staff cleaning the equipment. For this issue, we developed a new, standardized list of cleaning responsibilities. This standardize cleaning processes included IV pumps (which may have medicine bags attached to them) and telemetry monitors across the hospital. We believed doing so would decrease the chance of contaminated equipment not being cleaned. A list of the items that needed cleaning along with the person responsible was written and placed online for reference (**Table 2**).

We surprisingly found a substantial amount of CDI contamination in the common nutrition area. Apparently food trays from isolation rooms were being placed in this area by dietary employees who did not follow proper isolation techniques by donning a gown. We concluded that CDI education and training for each of the dietary employees was necessary and that this training would occur for dietary employees during their orientation period.

EVS had been using a 10% hypochlorite solution to clean each CDI room. UV lighting was also being used on each isolation room at the time of discharge. When the committee was formed, EVS reviewed their cleaning policies with what was found in the literature. The cleaning solution was not changed, but it was found that UV lighting did not always happen at the time of discharge. Staff was educated to place a terminal clean order for the isolation rooms to ensure that UV lighting was completed. Audits to ensure that policies are being followed are completed on a weekly basis and reviewed in the CDI committee meeting. As of January 2018, EVS was at 94% accuracy on cleaning isolation rooms with UV lighting. Staff have audits completed on each isolation room that they clean. After the room is cleaned, high touch surface areas are tested for cleanliness. If the staff member has more than three surfaces that are not testing clean, then remediation is completed.

Pharmacy worked in conjunction with the physician director of Infectious Disease to review the ASP protocol. The review showed that the ASP is closely following the most recent evidenced based practices recommended by SHEA and the literature. PPI discontinuation in high risk patients was not found to make a significant impact on CDI rates and was not instituted. Each HACDI is reviewed to evaluate antibiotic and medication choices. If changes are warranted for that individual patient, then the necessary changes will be made.

In terms of budgetary effects of the QI program, the accounting representative found that the disposable gowns actually cost less, per gown, than the re-usable gowns and that the shelf life of the disposable gowns was long enough that it would not expire before use. The cost analysis did not take long and the supply was shipped expeditiously. The other large budget component involved the time required for staff education. Since the CDI committee was comprised of staff members, all of the meetings were conducted during normal business hours and employees did not require any extra payment. All of the time spent on the QI project was accounted for by their normal salary. The Link nurses educated the staff during working hours as did infection control and the managers of the unit. Audits were performed by an agency which was already purchased by the hospital. While UV lighting had already been purchased by the hospital, its consistent use increased the need for towers. This cost was deemed negligible by hospital administration and warranted no further inquiry from business administration.

Small supplies were the last part of the budgetary concerns. New bins for isolation carts were purchased at a low cost to the hospital. Each new bin was under 100 dollars and under 10 were purchased. From a budget standpoint, this quality improvement project was simple. Most of the needs were already in the hospital with very little new equipment to be purchased. Staff completed the necessary work during normal business hours and required no overtime. Gowns were purchased at a lower cost than expected and it was within the laundry budget for the previously used reusable gowns. Overall, the budget impact was minimal in part due to the judiciousness of the committee and their intervention selection tool.

### **Results/Outcomes Aim 2.**

A PowerPoint education supplement was created and placed on the computer based learning website. The PowerPoint was designed to teach the staff about CDI, how it is prevented

and spread, how to document about a patient's stool to help clinicians identify those in need of testing and how to test for CDI. It also instructed the staff on protective equipment that should be worn into the room each time the staff entered. How to safely transport patients and how to clean equipment to prevent the spread of HACDI was also discussed. Case study scenario questions were placed at the end to test the staff's knowledge. A passing grade must be earned in order to receive credit for reviewing the PowerPoint. Not completing the educational material can result in the employees' inability to work. The nurses meet the rounding group prior to entrance into the patient's room. The nurse is responsible for reminding the staff to gown and glove prior to entering the room. Likewise, they are to remind them to wash their hands with soap and water prior to exiting the room. A compliant with this intervention is that it is difficult for the staff to always make rounds with the physicians in the morning. However, when the nurse can make rounds, it is beneficial to the patient and the staff. The staff are able to help remind the physicians and ancillary staff to wear the proper gowns and gloves. Overall, the feedback from daily rounds is favorable.

The staff have not been in agreement with all of the changes. The new signs were received with mediocre results. Some staff felt they made a difference while others did not. Rounding with the physicians was one of the most well received changes. The staff enjoy rounding with the physician team and wish that staffing ratios always allowed for this to happen. The relocation of some isolation supplies to the floor stock has had the largest impact. The creation of more isolation carts has improved access to isolation supplies and decreased staff frustration. The committee continues to monitor access to supplies and refilling of the isolation carts to ensure that any problems are addressed quickly.

Lastly, the creation of the CDI handbook has not been started. The creation of the educational PowerPoint has taken precedence over the creation of the handbook. While the handbook may be created at a later time, it is not an active intervention at this time. If it is created, then it will be released to the staff in print on each nursing unit and on line for reference.

### **Results/Outcomes Aim 3.**

In the baseline period (i.e. Fiscal Year 2016), a total of 100 CDI cases were reported at UCMC (**Table 3**). This number remained relatively stable in Fiscal Year 2017 where 102 CDI cases were reported when the planning and implementation for this QI project first began. There was a substantial amount of monthly variation in CDI rates in both time periods. CDI rates peaked in October and were lowest in April (see **Figure 1**).

After the CDI policy was implemented in the pilot unit, we noticed a steady and stable decrease in the number of monthly reported CDI cases (see **Table 3** and **Figure 1**). When comparing monthly CDI totals from July-December of Fiscal Year 2016 (N=50) and Fiscal Year 2018 (N=38), we observed 12 fewer cases of CDI infection in this time period. When comparing monthly CDI totals from July-December of Fiscal Year 2017 (N=57) and Fiscal Year 2018 (N=38), we observed 19 fewer cases of CDI infection in this time period.

### **Discussion/Conclusions of Reducing HACDI**

Our original goal was to reduce the overall number of CDI cases by 32 in fiscal year 2017. While this objective was not been met, some demonstrable improvements in clinical practice and overall CDI rates have been achieved. These improvements have been reached with the implementation of stocking isolation supplies on the floor that can be used until the isolation cart comes up from central supply. The other interventions that were included around this time were a review of the antimicrobial policy by pharmacy. Another intervention that was completed



on 8CCP was to remind the rounding physicians and staff to wash their hands with soap and water before coming out of the room. New signs were placed on the door to help identify patients that were in isolation plus for CDI. Terminal cleaning of the rooms was changed to include UV lighting as an adjunct therapy to properly cleaned HACDI rooms at the time of discharge. A revision of the responsibilities for cleaning different pieces of equipment in the room was also completed. This helped to ensure that each room was cleaned in a consistent manner and that all pieces of equipment were cleaned before being removed from the room. Lastly, the reusable gowns were changed to disposable gowns in September of 2017. This eliminated a possible infection source from long used gowns that had lost antimicrobial coating but were not discarded.

### **Limitations to the Clostridium Difficile Quality Improvement Project**

As with any project, there are limitations to this quality improvement project. First, a single unit was evaluated versus an entire hospital. Second, the implementation of the interventions has not been completed throughout the hospital. Third, the project took much longer than planned. Each of the limitations affects the evaluation of the overall project and will be addressed individually below.

First, 8CCP had been chosen as a pilot unit to trial changes to the current policy. While some changes have been made, the changes are not formalized. It is difficult to ensure that the changes that have been made are responsible for the decrease in the number of HACDI that has been seen this fiscal year. It is also difficult to base more changes from results seen on only one unit.

Secondly, all of the interventions that are recommended by the literature have not been implemented. Implementation of the interventions is taking much longer than originally planned.

Without implementing all of the interventions, it is difficult to know how successful the bundle implementation will be once completed. Lastly, the project is taking much longer originally planned. When started, the interventions were to be implemented within 6 months. However, it has been two years since the project was started. The overall goal for the project has not been reached, but there have been some improvements made in the number of HACDI seen after changes in the types of gowns used.

**dissemination of results and importance of the chosen venues.** It is important to let the committee and 8CCP staff know that the change in gowns and addition of isolation supplies to the floor have made a slight impact. It will help the staff to know that even these small changes have made an impact. Once the entire project is completed it will be important to disseminate the results through publication and staff education. These two venues are important because similar institutions need to know how to decrease the number of HACDI. After all, decreasing HACDI for one small portion of the overall population will help increase the health of all. Spreading this to other communities will slowly increase the health of states and nations. Staff education is important because it will help ensure that the results continue.

**chosen audience to teach infection control of CDI.** Dissemination of the results of any project is one of the most important parts. Improving the practice of all healthcare institutions is why quality improvement projects are completed. Therefore, the audience chosen to present the findings to is important. For this project there are several audiences that would need to be reached. The audience for this project would be the staff for UC Health (WCH and UCMC), staff from similar institutions through publication of the results and future researchers to continue evaluating the effectiveness of the interventions.

Dissemination of the results to UC Health staff is important so that all of the interventions and policy changes made will be continued after the project is done. It is also important for them to understand why each intervention is important. The bundle will not work if not implemented in its entirety. The staff must understand this to ensure that all pieces are followed as intended.

Institutions of similar size and patient population would benefit from the work completed at UCMC to ensure that their patients are receiving the best care possible. After all, improving the health of all patients, despite their location, is the main goal of quality improvement projects. Therefore, disseminating the findings of this project through publication is important. Showing replication of results at other institutions is an important part of research.

Lastly, future research depends on research from the past. All research studies have to show repeated replication in order to prove the validity of the original research. Each time another study replicates the findings of previous studies, the results are validated again. It is important to publish these findings so that new interventions can be made to decrease HACDI in the future. It is imperative that the results of this project are published to continue the fight against HACDI.

## **Conclusion**

The implementation of the CDI bundle at UCMC has not been completed entirely. However, changing to disposable gowns instead of using reusable gowns and relocation of isolation supplies to floor stock have been completed. On 8CCP, there has been one less case of HACDI in the first half of fiscal year 2018 than there was in fiscal year 2017. UCMC has seen a decrease of 19 cases for the first half of fiscal year 2018. While this isn't a huge decrease, given the small unit and small number of patients involved, it shows that there is a small difference

being made. Full implementation of the bundle must be completed in order to truly know the full impact.

Once the bundle is fully implemented it is imperative that the results be disseminated to the right audience. The first group to be educated about the changes will be the staff of UC Health. They must understand the different parts of the bundle and why it is important for it to be followed. If not, then compliance with the bundle will be low. Next, institutions of similar size and patients will need to know the outcome. UCMC is not the only institution fighting HACDI. Other institutions will benefit from the findings at UCMC and have decreased numbers of HACDI. Lastly, the findings should be published so that future research can be completed and other institutions in different regions can benefit.

## **Chapter Five- Recommendations and Implications for Practice**

### **Project Summary for Reducing Hospital Acquired Clostridium Difficile**

This project began in January 2016 when it was found that the cases of HACDI were at a critical level (**Figure 2**). It was at the height of CMS following infection trends for Foley catheters and central lines (Lipp, Nero & Callahan, 2012). It was at that time that the CDI policy at UCMC was reviewed. That review revealed that the policy was lacking. To start the process, the Link nurses were asked to evaluate the current isolation process in their meeting. The process was reviewed using the 8 Step Process that UCMC utilizes for all quality improvement projects.

Prior to the 8 Step Process, a review of the literature was completed. Bundle interventions were shown, by the literature, to be the most effective in reducing the number of HACDI cases. At that time, the 8 Step process began. It started with a clarification of the problem. The current UCMC process was compared to evidenced based interventions to prevent HACDI. Deviations from evidenced based practice were noted. Next, a goal was set and the process map was established. The goal was make the UCMC process match the evidenced based guidelines which would lead to a reduction in the number of HACDI.

Throughout this process, it was necessary to stop and evaluate how to fix the process at UCMC. For example, types of isolation gowns and location of isolation supplies were evaluated. This led to disposable gowns being used on each unit and a few isolation supplies being stocked on each floor to reduce the time that the isolation order would be completed. Lastly, an overall plan was formed and progress was tracked. The plan was to make 8CCP a pilot unit to trial the interventions and make a concrete policy for the entire UC Health system to follow. All of this was to be done within 6 months.

The overall goal of the project has yet to be met. However, improvements have been made. First, isolation supplies are now located on the floor so that isolation of the patient can occur quickly. Before, it could take hours before the cart was delivered to the patient's room. This increased exposure of CDI to other patients. The reusable gowns were not being tracked appropriately and were losing their antimicrobial coating. Therefore, they were not adequately preventing infection. Since the change, there has been a small decrease in the number of HACDI on 8CCP. The ultimate goal of implementation should occur within the next year.

### **Implications for Practice to Prevent Clostridium Difficile**

Reducing the number of HACDI is imperative to the health and well being of all patients (Lipp, Nero & Callahan, 2012). Providing quality healthcare is the mission of UCMC and it is the responsibility of all Doctoral prepared nurses ([www.aacnnursing.org](http://www.aacnnursing.org)). Improving the health of patients by reducing their risk of CDI is a self imposed goal at UCMC. The process of improving patient care follows the essentials of nursing practice set forth by the American Association of Colleges of Nursing. The combination of Doctorate of Nursing Practicing Essentials and UCMC healthcare goals will be discussed below.

**DNP essentials in relation to UCMC goals.** DNP essentials outline the competencies that are core to each of the advanced practice nursing roles ([www.aacnnursing.org](http://www.aacnnursing.org)). Three of the eight essentials address the need to promote accountability and quality of healthcare. Clinical scholarship and interprofessional leadership are also addressed within these essentials. Reduction of hospital acquired infections (HAI) fall directly under DNP essentials II, III and VI.

Essential II addresses the need to ensure financial accountability, policy awareness and providing quality healthcare. Patient safety is also addressed by this essential. Essential II charges the DNP nurse to develop and implement policies for healthcare practices/systems that

improve the quality of healthcare in an economical manner. The acknowledgement that CDI practices at UCMC were lacking was the first step in meeting Essential II. Upon this realization, a literature search was started to establish best practices for decreasing CDI. Reducing the number of infections will not only decrease healthcare expenditures, it will provide quality healthcare to the people of Cincinnati. Before deciding on interventions to implement to address the problem, a feasibility review of the intervention was performed. Interventions were chosen based on the ease of implementation and low cost. All of these actions satisfy Essential II. Literature searches to evaluate best practices per the evidence satisfies Essential III.

DNP Essential III addresses clinical scholarship and analytical methods for Evidenced Based Practices. This essential promotes the application of relevant findings to develop practice guidelines. These guidelines are meant to improve practice, evaluate processes and systems of care so that comparison against national benchmarks can take place. The benchmarks are meant to determine variances in practice outcomes and population trends.

For this project, an extensive literature search was performed to evaluate the best practices found by research and others' practices. These practices were then compiled and current UCMC practices were evaluated. Then, UCMC rates of CDI were compared against Vizient participating hospitals. Since UCMC rates were not where the organization wanted them to be, new policies and procedures were adopted per research findings. The action of developing these practices and finding where UCMC policies were lacking fulfilled Essential VI.

DNP Essential VI involves leading interprofessional teams in the analysis of complex practices and organizational issues. The development of a policy to address the practices of all nurses, doctors, nutrition services, housekeeping and administrators within a large health system such as UCMC requires personnel from each department to discuss and dissect their practices.

Interprofessional collaboration meets the requirement of DNP Essential VI.

An interprofessional group met to discuss the current practices at UCMC. After deficiencies were identified, the best practices were evaluated with a literature search. These practices were then placed into a protocol for the staff to follow. Prior to beginning the search for best practices, current rates of CDI were recorded. Throughout the change process, the number of cases were discussed on a weekly basis. DNP prepared nurses led this movement to improve practice with evidenced based research with the goal of meeting the project's objectives.

**Continuation of the project to reduce HACDI.** The project to reduce the number of HACDI needs to continue until the goal is met. HACDI is the main cause of diarrhea in hospitalized patients and it is the cause of 250,000 hospitalizations and 14,000 deaths per year (Lipp, Nero & Callahan, 2012; Karanika, et. al., 2015). Therefore, it is imperative that the project continues until there is a significant reduction in the number of HACDI at UCMC. Not continuing the project would mean that UCMC has failed in its' mission to improve the health and well being of the people of Cincinnati ([www.uchealth.com](http://www.uchealth.com)). The committee must continue the work that it has started.

**Those who should be involved with reducing HACDI.** At the beginning of the quality improvement project, a CDI committee was established. This committee, led by the Quality Improvement Director, should be the core group of people involved in continuing the project. Managers from each unit should be included as the project is expanded to include the entire hospital. All UCMC staff members should be included in the education process as well. Everyone must be involved in order for this project to successfully reduce the number of HACDI at UCMC.



**Recommendations for application in other settings.** After the project is finished, other university hospitals will be able to build on the work that was done at UCMC. Hospitals similar to UCMC are struggling with HACDI and how to decrease the spread of the disease to patients (Lipp, Nero, & Callahan, 2012). Nursing homes and long term care facilities would find the implementation of this bundle effective in reducing the number of CDI as well. Researchers will build on the work completed at UCMC for future studies. There are many healthcare areas that will be able to apply the work completed by UCMC.

### **Identify Methods for Dissemination of Policies to Reduce HACDI.**

Once the entire project is completed it will be important to disseminate the results through staff education and publication. These two venues are important because staff need to be educated about how to reduce the number of HACDI. Staff will be responsible for ensuring that results continue and for carrying out the interventions for years to come. They will also need to continue to evaluate practices to ensure that the most recent evidenced based practices are being followed. A handbook with the policy information will be placed on each unit for each staff member to review when they have a patient they suspect or have confirmed HACDI. Annual educational PowerPoints will be part of the computer based learning for each staff member.

Similar institutions need to know how to decrease the number of HACDI as well. This can be done through publication and speaking engagements. Publication will allow large numbers of hospital administrators and practice providers to review the results and make changes in their practice. Speaking engagements or poster presentations will increase the audience reached with these results.

**Chosen audience to teach infection control of CDI.** Dissemination of the results of any project is one of the most important parts. Improving the practice of all healthcare institutions is

why quality improvement projects are completed. Therefore, the audience chosen to present the findings to is important. For this project there are several audiences that would need to be reached. The audience for this project would be the staff for UC Health (WCH and UCMC), staff from similar institutions through publication of the results, speaking engagements and poster presentations and future researchers.

UC Health staff is important so that all of the interventions and policy changes made will be continued after the project is done. It is also important for them to understand why each intervention is important. The bundle will not work if not implemented in its entirety. The staff must understand this to ensure that all pieces are followed as intended.

Institutions of similar size and patient population would benefit from the work completed at UCMC to ensure that their patients are receiving the best care possible. After all, improving the health of all patients, despite their location, is the main goal of quality improvement projects. Therefore, disseminating the findings of this project through publication is important. Speaking engagements and poster presentations also reach a large audience. The more exposure that the project receives, the more people learn about how to adequately reduce HACDI. The more practices improve at all healthcare institutions the less HACDI there will be. Showing replication of results at other institutions is an important part of validating the research completed at UCMC.

Lastly, future research depends on research from the past. All research studies have to show repeated replication in order to prove the validity of the original research. Each time another study replicates the findings of previous studies, the results are validated again. It is important to publish these findings so that new interventions can be made to decrease HACDI in the future. It is imperative that the results of this project are published to continue the fight against HACDI.

**Conclusion**

The CDI quality improvement project began in January 2016. Link nurses helped to identify the current process at UCMC and identify where the process was broken. An extensive literature review showed what interventions were necessary to reduce the number of HACDI cases. The 8 Step process, the systematic review process chosen by UCMC, helped set a goal, a timeline and a plan for implementation. While the timeline goals were not met, the process continues. Stocking of isolation supplies on the floor and changing to disposable gowns have shown some improvement in the cases of HACDI. Completion of the project should show a thirty-two case per year reduction in HACDI that UCMC is hoping to achieve.

## **Chapter Six: Conclusion**

CMS is now following trends of major causes of hospital acquired infections. These include Foley catheter infections, Central Line infections and pneumonia. An even more sinister and potentially deadly bacterium, CDI, is predicted to become the next bacteria to be tracked by CMS. Regardless of the financial implications of such a decision by CMS, UCMC is concerned about the annual number of HACDI within the facility. Therefore, the Chief Nursing Officer made decreasing HACDI a major QI initiative.

This QI project began with an extensive literature search to review the best evidenced based practices. Link nurses were interviewed to review the current isolation policy and evaluate the process. The 8 Step Process, UCMC's model for enacting change, began in April 2016. At that time, a goal of reducing the amount of CDI cases by thirty-two per year at UCMC was set. The CDI committee began meeting weekly in May 2016. Three aims were set to help UCMC achieve their goal of reducing CDI cases. These aims were to rewrite the policy to reflect the most current, evidenced based practices to reduce CDI, educate the staff and evaluate the QI project progress.

Budgetary concerns were minimal, but the rewards for successful completion were immense. It would save lives, improve healthcare to the people of Cincinnati and meet the mission of UCMC. Acceptance of the need for change was high. Key stakeholders and staff were involved at every step of the QI process. A self imposed goal of reducing the number of HACDI by thirty-two by the end of fiscal 2017 was set. Weekly meetings of the CDI committee met weekly with Infection Control reporting the number of HACDI per week. Progress after implementing the change to disposable gowns and relocation of isolation supplies was closely

tracked. However, no further interventions were implemented hospital wide by the end of fiscal year 2017.

The goal of having this completed by fiscal year of 2017 was not realized. Changing to disposable gowns and relocating isolation supplies saw a small reduction in the number of HACDI in the first six months of fiscal year 2018. Many more evidenced based interventions need to be implemented and data collected in order to evaluate how effectiveness of the bundle.

After the implementation of the entire bundle the findings should be disseminated to other institutions through research publication, speaking engagements, and poster presentations. All of these methods will reach an audience of healthcare providers that will benefit from the knowledge gained at UCMC. In doing so, UCMC will reach its' goal of providing excellent medical care to the people of Cincinnati, but also continue to improve the medical education of medical providers everywhere.

This quality improvement project meets the expectations of DNP Essentials II, III and VI. Essential II addresses financial accountability in healthcare. This project, once fully implemented and successful, will decrease hospitalization costs. The cost of implementation was very low as well. Essential III addresses clinical scholarship of the practicing DNP provider. With this project, an extensive literature review was completed. The interventions chosen were all shown to decrease the incidence of HACDI. Lastly, Essential VI addresses leading interprofessional teams. The committee established to evaluate the current practices at UCMC involved members from all healthcare departments. This quality improvement project not only improves the health and well being of patients, it also meets the essentials of practice by a doctoral prepared provider.

The importance of this quality improvement project can not be underscored. It will improve the lives of patients in Cincinnati. It will also decrease healthcare costs. Improving lives

through fiscally responsible, evidenced based healthcare is the mission of UCMC. Doing so provides excellent, affordable healthcare to the people of Cincinnati. If one academic healthcare system can make this change, then others will follow. By disseminating the knowledge learned from this QI project, other academic healthcare systems can improve lives.

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Table 1. Intervention Scoring Table Ranked by Cost and Ease of Implementation

	Cost	Ease of implementation	Total	
Standard Work for CDI/EVS procedure for cleaning	3	3	9	
Isolation cart follows patient	3	3	9	
Screening process for removal of isolation after 48 hours no diarrhea	3	3	9	
Design process for efficient isolation rooms	3	3	9	
Develop a Keyboard cleaning process	3	3	9	
Isolation: where to wash hands/take off gowns	3	3	9	
Review of C. Diff order sets	3	3	8	
UCH wide policy	3	3	8	
Screening assessment by RN	3	2	8	
Order test, physician, does it meet criteria	3	2	8	
Isolation Cart-getting/filling the cart	2	3	8	X
Renew ambulation process	3	3	7	X
UTI pts/pneumonia for pilot study (7NW)	2	2	7	X
Decide on visitor policy for contact	1	1	3	X
Air Oasis (different UV cleaning	0	0	0	X
Transport Bed Process	0	0	0	X
Visitor isolation process	0	0	0	X
Toilet Bowl Swap	0	0	0	X
Antibiotic timeout	0	0	0	X
EVS cleaning process	0	0	0	X

Legend: 3-big impact, 2-moderate impact, 1-low impact x-will not consider

Table 2. Cleaning responsibilities

Telemetry Equipment	CDU
Carts	Central Service
Commodes taken to soiled room	Central Service
CPM machine taken to soiled room	Central Service
IV poles taken to soiled room	Central Service
Portable suction taken to soiled room	Central Service
Pumps taken to soiled room	Central Service
T-pole taken to soiled room	Central Service
Blanktral taken to soiled room	Central Service
Breath A-Call taken to soiled room	Each individual or department
Pagers taken to soiled room	Each individual or department
SpectraLink phone	Each individual or department
Stretchers	Each individual or department
Wheelchairs-prior to use	Each individual or department
Equipment affixed to room	EVS
IV poles left in room	EVS
Lead wires part of room	EVS
Microwave-patient use	EVS
O2 flow meters	EVS
Pyxis	EVS
Refrigerator-patient use	EVS
Suction regulator	EVS
Specialty beds	EVS
Blood pressure cuffs-affixed to wall	EVS
Computer monitors-inside and outside room	EVS
High dusting	EVS
Horizontal surfaces	EVS
Bariatric chair	EVS
Supply bins/shelves	Materials management
Lead wires-mobile or between patients	Nursing
Point of care equipment	Nursing
Inside the IV pump	Nursing
Scales	Nursing
Thermometer probes	Nursing
Glucometer	Nursing
Tele sitter mobile unit	Nursing
Lifts	Nursing
Mobile Care Phlebotomy	Nursing
Blood pressure cuff-between patients & mobile	Nursing
Dynamats	Nursing
Electronic Medical Monitors	Nursing
Finger probes	Nursing

Bariatric chair	Nursing-if putting away after use
CPOE COW	Nursing-HUCS
Computer keyboards	Nursing-HUCS
Crash Carts	Nursing-HUCS
Call infection control with questions	584-7679

Table 3. UCMC Hospital Acquired Clostridium Difficile Infections for Fiscal year 2016, 2017, and 2018

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
UCMC FY 16	7	9	9	13	4	8	11	7	11	5	6	10	100
UCMC FY 17	5	10	8	12	12	10	10	9	10	4	9	3	102
UCMC FY 18	6	2	8	9	7	6							38
Total	18	21	25	34	23	24	21	16	21	9	15	13	240

University of Cincinnati Medical Center Fiscal year 2016 (July 2015 to June 2016) Fiscal year 2017 (July 2016 to June 2016) Fiscal year 2018 (July 2017 to June 2018).

Figure 1. University of Cincinnati Medical Center CDI rate comparison chart by fiscal year

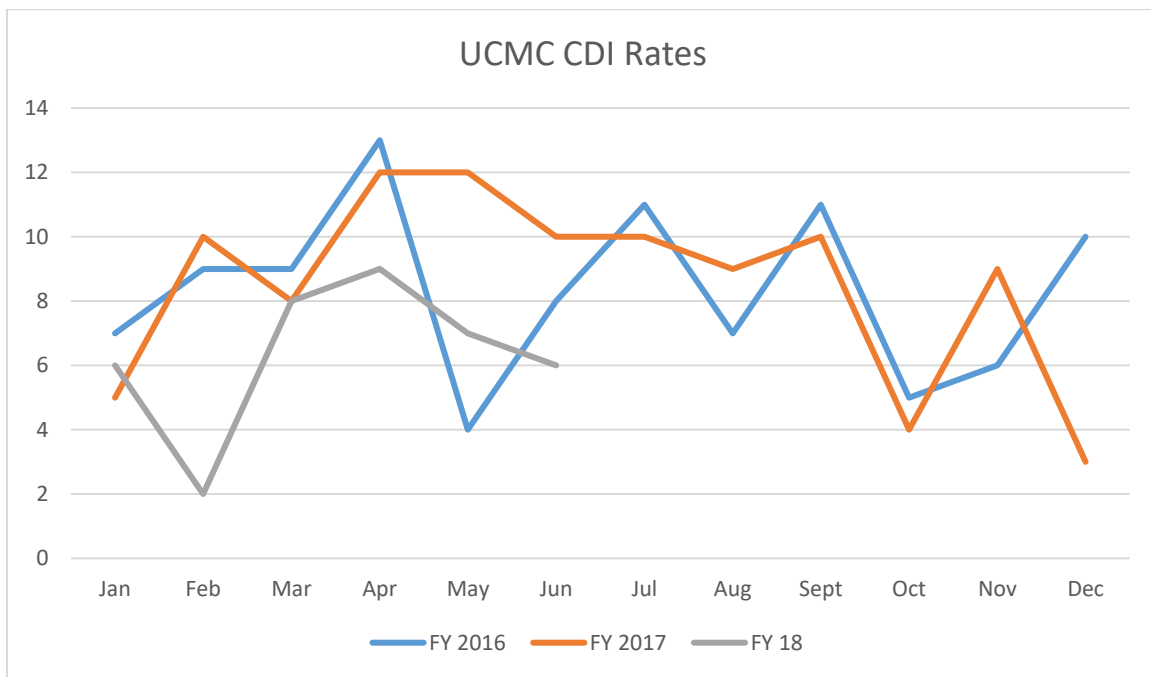


Figure 2. Timeline of CDI committee work

